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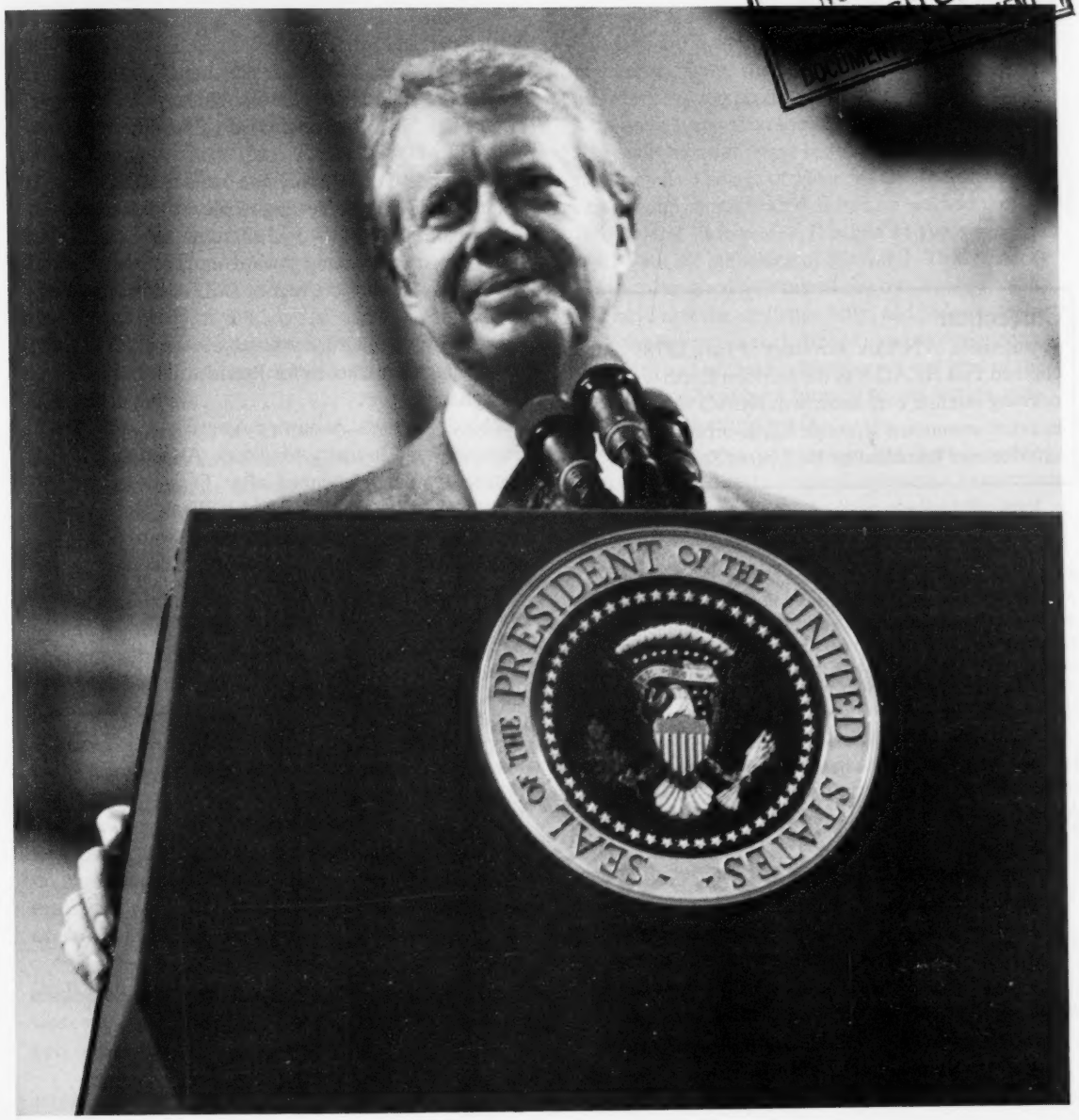

Cover

President Jimmy Carter discussed the space program at the Kennedy Space Center on the 20th anniversary of NASA, Oct. 1, coincidentally his own birthday.

Correction

A statement in NASA *Activities* of July 1978 claimed that HEAO was the heaviest Earth-orbiting satellite ever launched. HEAO was the heaviest *unmanned scientific* Earth-orbiting satellite ever launched *by the United States.*

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Letter from Washington

Dear Colleagues:

On Oct. 1, 1978, President Carter spoke at the Kennedy Space Center on the occasion of NASA's 20th anniversary at ceremonies during which he awarded the Congressional Space Medal of Honor to six former astronauts.

I know that each of you will be encouraged by his words and the policies they envisage. The verbatim text follows:

"Governor Askew, Senator Chiles, Senator Stone, Senator Stevenson, who is the Chairman of the Subcommittee on Energy and Technology, Congressman Tiger Teague—who is the retiring Chairman of the Committee on Science and Technology, and who has done so much to bring our space program to our nation and who wrote the legislation establishing the Space Medal of Honor, Congressman Fuqua, Congressman Gibbons, Congresswoman Boggs, ladies and gentleman; Many of you have helped in past years to make the achievements commemorated this afternoon possible: this is one of the most exciting events of my life.

"For a number of weeks since I planned to come here, I have been thrilled at the prospect of meeting these famous men on my right [the medal awardees] who have done so much to inspire all those who love our country and who have confidence in the future of human beings.

"A few minutes ago, we watched a simulated takeoff and flight of Apollo XI. And my palms are still sweating with excitement and nervousness and I might say that I was not the only one. The astronauts' palms were sweating even more than mine.

"I believe it is accurate to say that we are here today to recognize and honor six American pioneers of the farthest and highest of all frontiers, the frontiers of space. We honor them for individual human qualities, dedication, skill, extraordinary courage. But we do more than that. What those men have done is the most visible part of a vast and continuing collective accomplishment of many people.

"Tens of thousands of Americans, many of you, including scientists, engineers, administrators, skilled workers, others, have contributed directly to the success of the American space enterprise. They in turn have had the support of an entire nation and the good wishes of an entire planet.

"The glory that belongs to the six recipients this afternoon of the Space Medal of Honor belongs equally to those who helped them, and in a real sense, to all humanity who prayed for them and who supported them.

"This does not diminish the glory of these American heroes. It enlarges their glory. It is fitting that these ceremonies take place today on the twentieth anniversary of the founding of the National Aeronautics and Space Administration. And it is, of course, fitting that they take place here where the ships that took men to the moon were launched and where we will take our next great step into space with the first flight of the space shuttle, which I sincerely hope will be before my next birthday.

"I have every assurance from those involved that there will be no slippage in the present schedule as it now stands. The age of space, as Dr. Frosch said, can now be characterized as having reached the threshold of its maturity. It began 21 years ago this week with the launching of Sputnik I. That remarkable achievement galvanized our own space efforts. We have met the challenge fully, and indeed, we have gone far beyond that challenge. And as Americans, we are proud of these achievements and glad of the benefits that have been brought to our Nation and, indeed, to the entire world.

"We speak often of progress. But there is nothing in scientific and technological experience to compare with the enormous leaps we have made in the brief span of the two decades of the space age.

"We have performed what any generation would have considered miracles. We have taken the stuff of fantasy and dreams and we have turned it into accomplishment and reality.

"The dreams of a few visionaries have become a part of the every-day life of hundreds of millions of people. Consider what we have done in just one quarter of a human lifetime. We have put men in orbit around the earth and around the moon. We have put machines in orbit around the earth, the moon, the sun, and the planet Mars. We have learned to maneuver in space, to dock ships together in space and even to walk in space.

"On board Skylab we have learned to live and work in a weightless environment for many weeks at a time. We have begun the exploration of the inner planets and the outer planets.

"Two American Vikings have been sending back

valuable scientific data from the surface of Mars for more than two years.

"Pioneer X has passed Jupiter and is on its way to interstellar space. It will be the first tangible product of human hands to leave the solar system. Its flight time may turn out to be longer than the life of civilization that launched it. Of course, its destination is unknown. But like the entire effort of space exploration, it is a striking symbol of human curiosity, human ingenuity and the very human desire to communicate with others.

"Of course, the greatest event of all, we went to the surface of the moon, not once, but six times. And each time, the astronauts returned safely to their home planet, Earth, and to their home country, the United States of America.

"In the years since a man took that one small step, the giant leap it represented has almost come to be taken for granted. Yet, at the outset, many doubted it could be done at all. And many more doubted it could be done in so short a time. But it was done. And it was done magnificiently.

"The goal was met. This great space center is deservedly named for the man who summoned his fellow citizens to an extraordinary adventure, President John F. Kennedy.

"We went to the moon, in part, as a matter of national pride. But when we got there, we discovered something very interesting. Through the eyes and the cameras of the astronauts, we looked back at the earth, above the strange horizon of the moon in a pitch black sky, we saw our own world as a single delicate globe of swirling blue and white, green, brown, from the perspective of space; our planet has no national boundaries.

"It is very beautiful, but it is also very fragile. It is the special responsibility of the human race to preserve it. Of all the things we have learned from our explorations of space, none has been more important than this perception of the essential unity of our world.

"I learned this morning that while I was at Camp David with President Sadat and Prime Minister Begin, that scientists at Cal Tech discovered a new mini-planet whose orbit comes between that of earth and that of Mercury. The new mini planet has just been named Ra Shalom, Ra being the Egyptian Sun God, and as you know, Shalom being the word for peace.

"This I think vividly demonstrates that we on earth have a responsibility to unify the people of the world in peace and harmony and preserve the lives of those that were observed so distantly by the astronauts from the moon.

"Space has brought us a great deal of human knowledge and also a great deal of technical knowledge. It may also have brought us a measure of wisdom. Today we celebrate the accomplishments of the past, in the spirit of the men we honor; we also look toward the future, a future that is as exciting as anything that has gone on before.

"The first great era of the space age is over. The second is about to begin. It will come into its own with the new Space Shuttle, the heart of our new space transportation system when it becomes operational.

"With its ability to life a payload of up to 32 tons into orbit on mission after mission, the shuttle will give us a regular frequent and economical access to space. Like the sea, the land and the air, the space will become an environment in which human beings can live and work for the welfare of their own species.

"Paradoxically, the most exciting thing about the space shuttle is that it will make our use of space in the future routine and perhaps not very exciting.

"The first generation of space activities was driven in large part by a single exciting transcendent goal, the quest for the moon. In the second generation, thanks to the versatility of the shuttle, our activities in space will be enormously varied.

"We have invested so far some $100 billion over the history of our American space programs. It is now time for us to capitalize on that major investment even more. We have already reaped many practical benefits from space. Over the next generation, these benefits will increase geometrically.

"Communication satellites have already made global communications instantaneous, reliable, cheap. They have brought remote areas of the earth out of their isolation. We will continue to develop them.

"Weather satellites have already saved billions of dollars, thousands of lives through early warnings of hurricanes and floods. We will continue to develop them. We have greatly strengthened our national security through defense space applications. We will continue to develop these capabilities.

"Photo reconnaissance satellites have become an important stabilizing factor in world affairs in the monitoring of arms control agreements. They make an immense contribution to the security of all nations. We shall continue to develop them.

"Earth resources satellites have already proved their value to many countries through remote sensing. They tell us about everything from the location of mineral and energy deposits to the condition of our

crops, from the motion of icebergs to the health of the oceans.

"We will continue to develop and to use these satellites for the benefit of all people of the world.

"Aboard the shuttle on many of its missions will be the European-built laboratory, the Spacelab. Scientists of many nations will use the space lab to do research in all branches of science and engineering. No one can say where this research will lead, but carefully selected experiments could yield direct benefits in the coming decades.

"I am often asked about space factories, solar power satellites and such other large-scale engineering projects in space. In my judgment, it is too early to commit the Nation to such projects. But we will continue the evolving development of our technology, taking intermediate steps that will keep open possibilities for the future.

"During the period of the Saturn-Apollo missions, we were pilgrims in space, ranging far from home in search of knowledge. Now we will become shepherds tending our technological flocks, but like the shepherds of old, we will keep our eyes fixed on the heavens.

"We are committed to the practical use of space. But we are equally committed to the scientific exploration of the solar system and the universe.

"In the 1980s, the 1990s, we will continue the direct reconnaissance of the solar system. Through the eyes of our remote cameras, we will see Mars and Venus, Jupiter and its moons, Saturn with its moons and rings, and comets and asteroids.

"The study of other planets, their climate geology, geophysics, perhaps their biology, will increase our understanding of our own planet. We will seek to learn more about the sun.

"Many missions will aim at this goal in the years to come. In one of them, an instrumented probe will journey far above the plane of the solar systems to look down at the never before seen polar regions of the sun.

"And finally, we will look out from earth's orbit to the very end of the universe, notably by means of the space telescope.

"In its orbit 300 miles above the earth's surface, the space telescope will at last let us see a universe without interference from the earth's orbit-obscuring atmosphere.

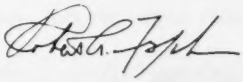
"It will be the centerpiece of astronomy for the decade beginning in the mid-eighties. Its contributions may dwarf all but the most fundamental discoveries of the past, leading to a quantum growth in our understanding of the basic nature of time, matter and energy.

"In the coming generation, the scope and the range of our space activities will reflect the range of our requirements and interests as a vigorous, responsible and free society.

"Those activities will be measured against all the needs of our country. We will be encouraging other countries to participate both in the work and in its benefits. But we will not give up the leadership of the United States in space.

"And finally, let me say, in the last analysis, the challenge of space takes us very close to the heart of things. It brings us face to face with the mysteries of creation, of matter, of energy, of life itself. The men we honor today met that challenge and they were equal to it. Our Nation met that challenge and was equal to it. And in the final two decades of the twentieth century, America will reach out once more to the beauty and to the mystery of space, and once again, America, you and I, will be equal to that great task. Thank you very much."

Sincerely



Robert A. Frosch

Carter Presents Congressional Space Medal of Honor

President Jimmy Carter recently honored six astronauts by awarding them the Congressional Space Medal of Honor, the first such medal ever awarded by the United States. Recipients are: Neil A. Armstrong; Frank Borman; Charles Conrad, Jr.; John H. Glenn, Jr.; Virgil I. Grissom (posthumous); and Alan B. Shepard, Jr.

The medals were presented by the President during a visit to Kennedy Space Center, Fla., on Oct. 1, the date that marks the 20th anniversary of the founding of NASA.

The award, authorized by the Congress in 1969, is conferred on an "astronaut who in the performance of his duties has distinguished himself by exceptionally meritorious efforts and contributions to the welfare of the Nation and of mankind."

The awards cited:

- Neil A. Armstrong, for actions to overcome problems and land his spacecraft safely on the

Gemini 8 mission in March 1966 and for "steady cool professionalism, repeatedly overcoming hazards" on the Apollo 11 mission in July 1969, when he become the first person to walk on the Moon.

- Frank Borman, who commanded the Gemini 7 mission in December 1965 and the Apollo 8 mission in December 1968, both of which "significantly hastened and facilitated achievement of the manned lunar landing objective." On Apollo 8, he commanded the first manned spacecraft ever to escape the Earth's gravity.

- Charles Conrad, Jr., who from August 1965 to June 1973, participated in four space flights of increasing duration, complexity, and achievement. His contribution culminated in the first manned Skylab mission in May and June 1973, when he commanded the crew that performed "lengthy, dangerous, and strenuous activities that were necessary to repair damage inflicted on the orbital workshop during launch and thereby save the two-billion-dollar program."

- John H. Glenn, Jr., the first American to orbit the Earth in the third manned mission of project Mercury in February 1962, when his professional handling of extreme difficulties with the spacecraft "demonstrated the value of the human pilot in space. . . . He returned to a nation and a world which seized on him as a major hero. This difficult role he handled with the same polite dignity that he brought to all his assignments."

- Virgil I. Grissom (posthumous), the second American in space, who, from 1961 to January 1967, participated in Mercury and Gemini space flights and lost his life during preparation for the first Apollo flight. Experience gained from the first manned Gemini flight in March 1965, which he commanded, led to "procedures necessary for the support of subsequent long-duration and rendezvous missions."

He died in a flash fire in January 1967 that swept through the Apollo spacecraft on the launch pad.

- Alan B. Shepard, Jr., who was the first American in space aboard the Mercury spacecraft in May 1961, which "demonstrated that this country lacked neither the courage nor the technology to compete in the new arena of space." He was also cited for showing "the highest qualities of leadership" as commander of Apollo 14, the third lunar landing mission in February 1971.

Winners of Highest Space Award—President Carter applauds the six to whom he awarded the Congressional Space Medal of Honor. They are (l. to r.): Neil Armstrong, Frank Borman, Charles Conrad, John Glenn, Betty Grissom (for Virgil I.) and Alan Shepard.

First Family at KSC— NASA Administrator Dr. Robert A. Frosch explains the fine points of the Space Shuttle to the President, the First Lady and Amy, as Dr. Alan M. Lovelace looks on.

Whitcomb Receives Business Association Award

Dr. Richard T. Whitcomb, an aeronautical scientist at NASA's Langley Research Center, was given the Meritorious Service to Aviation Award for 1978 by the National Business Aircraft Association, Sept. 13. Whitcomb is being honored as "an individual who, by virtue of a lifetime of personal dedication, has made significant contributions to the field of aviation," according to the award citation.

Two of Whitcomb's most significant contributions are the "area rule design"—a "Coke bottle" airplane shape that reduces drag and increases aircraft speed, without the need for additional power. The area rule design, discovered and verified by Whitcomb in 1952, is incorporated in every U.S. supersonic airplane now flying.

A second innovation, the "supercritical" wing, was developed during the 1960s and permits increases in the speed and range of subsonic (below the speed of sound) aircraft, without an increase in required power or fuel consumption.

Whitcomb began his career in 1943 with NASA's predecessor agency, the National Advisory Committee for Aeronautics. He heads Langley's transonic aerodynamics branch. He has received many honors and awards during his career, including the Collier Trophy in 1954, the Wright Brothers Memorial Trophy in 1976 and the largest cash award ever given to an individual by NASA, $25,000 for his supercritical wing in 1974.

Solar Simulator Helping to Set Standards

A unique artificial sun at the Marshall Space Flight Center, is being used to support the national program for setting standards to be used in the solar heating and cooling industry. It is the largest such facility in the country.

The center's solar simulator recently was used to provide data for a proposed State of California code governing testing and manufacturing of solar collectors. To collect data required for verification of standards set for the code, three distinct types of collectors were tested. Two of the test articles were flat-plate solar collectors made of different materials that used water as the heat transfer medium. The third was a single glazed collector with a non-selective absorber plate that used flowing air as the heat transfer medium.

In the simulator, temperature and light are precisely controlled to accelerate aging of collector materials. During the test period, instruments measured the temperature of the absorber plate and the insolation levels (light intensity) to determine the effect of the high insolation on the collector materials. Data on the degradation of the materials will enable the State of California to verify the proposed requirements for manufacture and test laboratory standards to be set in the proposed code.

The Marshall center facility was chosen by the Department of Energy to provide assistance requested by the State of California in keeping with DoE's efforts to establish uniform national standards for

solar heating and cooling systems. The solar simulator is part of Marshall's comprehensive testing program for the DoE National Solar Heating and Cooling Development and Demonstration Program.

Artificial Sunlight—Two technicians inspect a solar collector being tested in simulated sunshine at the Marshall center. The intense light of the simulator subjects solar collectors to daylight conditions 24 hours a day, shortening the process of testing from weeks to days. Shown are (l. to r.) Jeff Dystart and Neal Baker, employees of Wyle Laboratories of Huntsville, contractors in charge of solar testing operations at Marshall center.

U.N. Transmits Conference via CTS

The United Nations recently used the world's most powerful communications satellite, CTS (Communications Technology Satellite), operated jointly by the Lewis center and the Canadian Department of Communications to evaluate the feasibility of remote simultaneous interpretation of a conference and the transmission by facsimile of conference documents for remote translation into several languages.

The conference involved was the U.N. Conference on Technical Cooperation among Developing Countries held in Buenos Aires, Argentina, in August and September. Cooperating with the U.N. in the demonstration were COMSAT and ENTEL, an Argentina state-owned telephone company.

During the conference the picture and voices of the conferees were sent to a portable NASA terminal located at U.N. headquarters in New York City. What they said was interpreted and translated into five official U.N. languages and returned via CTS to a portable COMSAT terminal in Buenos Aires where the conference attendees then selected the language they wanted to hear.

The New York terminal was a NASA/Lewis-developed portable earth terminal developed by NASA-Lewis, a mobile, broadcast-receive studio with a two-and-a-half meter dish antenna designed for use with CTS. The Buenos Aires terminal, equipped with an 18-m dish antenna, was manned by its COMSAT designers.

Another phase of the experiment was the high speed simultaneous transmission on other CTS channels of copies of speeches and other documents from Buenos Aires to the U.N. headquarters where they were translated and returned the next day to Buenos Aires. The Rapifax facsimile equipment for that part of the experiment was made available by the Rapidcom Corp.

CTS is a joint program of the United States and Canada who share equally in the use of the spacecraft's communications capabilities. CTS was launched in January 1976 into a geostationary orbit at 116 degrees West longitude. The CTS earth terminals transmit at a frequency of 14 GHz and receive at 12 GHz.

The Lewis center developed the key element of CTS, the high power transmitter tube.

New Legislative Affairs Director

Terence T. Finn became NASA's Director of Legislative Affairs on Sept. 11, 1978.

Finn's last post was senior analyst for energy, science and space on the staff of the U.S. Senate Budget Committee. In that capacity, for the past four years he was responsible for the budgets of NASA, National Science Foundation and the Department of Energy. Before that, Finn was staff consultant to the

U.S. House of Representatives' Select Committee on Committees (Bolling Committee) from 1973 to 1974. His responsibilities there were to assist the Select Committee in reorganizing the Committee structure of the House.

Previously he served as legislative assistant to Senator Joseph D. Tydings of Maryland.

Finn earned his doctor's degree in American government from Georgetown University in 1973. He received his M.A. degree from the University of Sussex, England, in 1965 and his B.A. degree from Williams College, Williamstown, Mass., in 1964. He currently teaches a graduate course at The Catholic University of America titled "Congress and Budget." He also has taught at the Amercan University, the Department of Agriculture's Graduate School, and has lectured on the legislative process for the U.S. Civil Service Commission.

Finn is a member of the Montgomery County Ethics Commission. He has had direct experience with elective politics, serving as co-chairman of a congressional campaign committee. He is a member of the American Political Science Association and a life member of the American Aviation Historical Society.

Shuttle Landing Systems Tests Completed

With the help of NASA's Jetstar aircraft, the sophisticated microwave landing system that will automatically guide the Space Shuttle orbiter to soft landings at the Kennedy Space Center soon will be declared operational.

On loan from the Dryden Flight Research Center, the four-engined Jetstar was used at KSC to align the microwave scanning beam landing system in preparation for an October commissioning. The Jetstar made four engineering flight tests to verify the ability of the landing system to safely land the unpowered orbiter on the 4,572-meter runway.

The orbiter descends from space at a speed and angle comparable to the dive of a jet bomber. Just before landing, the craft gradually pulls up, then gently touches down. Because it is unpowered and cannot fly around for another approach, the glide path must be perfect. To fly such a path precisely, a computer is required to guide the aircraft through an automatic pilot. Conventional electronic beam landing systems cannot do this. Consequently, Cutler-Hammer's AIL Division developed the fully-automated microwave landing system for NASA.

The four engineering test flights were completed in September, and two additional flights in October. The landing system must be commissioned twice because the orbiter has the option of landing from either end of the runway.

The runway at KSC's orbiter landing facility is among the world's most impressive. Although specifically designed for the orbiter, it can accomodate any commercial aircraft flying today or planned for the future.

Down For A Breather—NASA's Jetstar aircraft recently completed its fourth test flight over the Kennedy center's runway. The engineering flights are to align the Microwave Scanning Beam Landing System installed at the Orbiter Landing Facility to automatically guide the powerless Space Shuttle Orbiter to a safe landing.

Family Ends Tech House Experiment

Preliminary results from a year-long energy conservation study at Langley Research Center show that a family probably can save considerable amounts of both money and energy through the use of new technical systems developed from the space program.

At the end of a year a volunteer family of four, living in a conventional house equipped with an unconventional technical systems designed to save energy and water, achieved these results:

- Total energy used for all purposes, including heating and cooling, was a little less than half the amount that would have been used in a conventional all-electric home under the same conditions.
- Total dollar savings from reductions in the use of energy and water amounted to more than $1,200 for the year, an average of more than $100 a month through the year.

The research project was conducted at the Technology Utilization House (called the Tech House), a contemporary-style house built at the Langley center to test equipment that is now available—or will be in the next few years—to the average homeowner.

The family of Dr. Charles W. Swain, a professor at Florida State University in Tallahassee, volunteered to live in the house for a year to give the technical systems a realistic test under normal living conditions. Dr. Swain, his wife Elaine, their daughter Carol (18), and son Charles (13), moved into the house in August 1977, prepared to live as normally as possible while many of their actions were monitored, sensed, measured and turned into computer printouts of data numbers.

"At times all of us in the family did have the feeling that we were guinea pigs," Dr. Swain said at the end of the experiment, "but that was part of the game. We did not, in any way dramatically alter our life style to make the most efficient possible use of what was available to us in the Tech House."

Despite their relative isolation while living in the house, the Swains became involved in community affairs. Swain was a training consultant in Langley's personnel division, providing advice on employee relations and establishing a learning center. Mrs. Swain, a registered nurse, worked in the medical surgical unit at Riverside Hospital in Newport News. Carol Swain completed high school while in Hampton, and Chuck Swain attended junior high school and was a volunteer worker at Langley's visitor center.

"One of the ways that we insulated ourselves against some of the psychological difficulties of living in the house through the year—and being isolated—was to try to live as normally as we could and, therefore, not make the most efficient use of the systems. We were given a Ferrari and drove it like a Model T," Swain said.

The Tech House is of contemporary, one-story design. It has a large living room with fireplace, dining area, kitchen, two baths, three bedrooms, laundry, two-car garage and an outdoor deck across the rear. Total enclosed living space is approximately 488 square meters.

After the year of research, Tech House engineers were pleased with the preliminary results of the project. Besides definite savings in energy and money, other early results indicate:

- All of the systems incorporated in the Tech House were put to use. Some systems worked better than predicted, some didn't work quite as well as expected, but the technical information collected will be extremely useful in redesigning or modifying some of the systems to make them more efficient.
- Once a detailed analysis is complete of all experimental data, the engineers will know a lot more about how to customize various systems to fit particular kinds of houses, or to suit areas of the country with different geographical and climatic conditions, or to meet special needs of individuals.
- The project was a catalyst for increased national interest in this type of research. People and organizations in this area, and throughout the country, have become more interested in the new technology—with its unusual systems and equipment—that was put to a realistic test in this experiment.
- The water recycling equipment, one possible "sleeper" system incorporated in the Tech House, may be of great value to homeowners in the future, especially if various areas of the country continue to experience periodic water shortages.

Preliminary performance figures on some of the major systems show these results:

Thermal design features, such as improved insulation, double-door entries that acted as air locks and special window shutters, accounted for about 60 percent of the energy savings, compared with a conventional home. These reduced heating requirements added up to about $700 of the total annual savings.

Solar collectors on the roof and a solar-supplemented heat pump system supplied more than 50 per-

cent of the energy required to heat the house. This amounted to about $300 of the overall energy savings.

Solar energy also provided approximately 35 percent of the hot water energy required by the Swain family, accounting for more than $100 of the annual savings.

Energy-efficient lighting, appliances and miscellaneous items of equipment accounted for the rest of the annual savings in energy use and cost.

The water recycling system reduced overall use of water by approximately one-third. This amounted to about 20,000 gallons of water conserved during the year.

A complete report, detailing results of the live-in experiment and comprehensive conclusions of the engineers, should be completed by January 1979. Based on the preliminary results, however, Tech House engineers have already discovered ways to save additional energy and water by making such minor systems changes as these:

- Improved insulation for the solar collector system's water storage tank should increase the Sun's contribution to the heating requirements by an estimated 20 percent.
- Doubling the size of the hot water system's preheat tank and making some simple modifications to the water piping system should increase solar energy contributions to the total hot water energy requirements by 10 to 20 percent.
- A slight increase in the size of the water recycling system's collection tank should increase savings by approximately 25 percent.
- Distributing heat from the special fireplace air-heating unit throughout the house via the air duct system would further reduce heat requirements, plus eliminate excess heat in the living room.

The Swains paid a prorated rent during their year-long "lease" of the Tech House, and their utility charges were based on rates paid by people in the Tidewater Virginia area. The Swain family was selected to live in the house from a list of seven families provided to Langley management by the American Council on Education, a non-profit organization in Washington, D.C., that sponsors university professors for work with the federal government for a year.

During their year in the house, the Swain family used all the special equipment. Neither the smoke alarm nor the tornado detector, both of which are only for emergency use, were ever activated. The family especially liked the window shutters, which not only saved heating and cooling energy, but eliminated most outside noise and provided a secure feeling when closed at night. The Swains used the low-voltage emergency lighting system three times during their stay, all during electrical power outages. The system provided very good lighting under prevailing conditions. Swain reported that the security alarm system in the house is easy to use and was armed on several occasions. And, because of special thermistor devices installed in all lamp sockets, the family replaced only one light bulb all year.

The Tech House project was funded by NASA's Office of Technology Utilization. The house was completed in June 1976 and was kept open to the public for about a year before the Swains moved into it.

The design of the house was selected from engineering studies made by the architectural firms of Forrest Coile and Associates, Newport News, Va., and Charles W. Moore Associates of Connecticut.

The Tech House was reopened Oct. 1 to the public. Tours are conducted to explain the technical systems in the house and how they operate to conserve energy and water.

A technical report, describing in detail, the various systems incorporated in the Tech House, and a complete set of drawings and specifications are available for purchase from:

North Carolina Science & Technology Research Center
P.O. Box 12235
Research Triangle Park, N.C. 27709; tel. 919/549-0671

First Spacecraft in New Environmental Series Launched

NASA launched Tiros-N a new operational meterological monitoring satellite from the Western Test Range on Oct. 13.

The first of eight in a third generation of polar orbiting environmental spacecraft, Tiros-N carries into space new environmental monitoring instruments that should provide significant technological advances over those on board the current NOAA (National Oceanic and Atmospheric Administration) series. Tiros spacecraft will replace the NOAA ones.

The Tiros-N series will be operated by NOAA's National Environmental Satellite Services. Support will be provided by a data retrieval and processing system especially designed to help meteorologists, oceanographers, hydrologists and other scientists to maintain and perhaps improve the quality of life on an increasingly complex Earth.

Potential benefits are: improved weather analysis resulting in more accurate weather forecasts; more specific location of ocean currents and areas of upwelling important to fishing and shipping interests; and more precise snowcover, snowmelt, and rainfall data essential to water resource management and flood forecasting.

Tiros-N satellites also are expected to give more accurate alerts of high energy solar radiation levels above the atmosphere that concern space missions, high-altitude commercial aircraft flights, long-range communications and electrical power distribution networks.

Because of its advanced data collection and platform location system, for the first time the Tiros-N series spacecraft will provide an operational capability to collect and transmit environmental data from platforms on land, at sea, and in the air. The spacecraft carries a stratospheric sounding unit from Great Britain and a data collection and platform location system from France. The other sensors were developed in the United States.

The Tiros-N series sensors and the systems on the ground that communicate, process and deliver the final products to the ultimate users are of great significance. The scanning radiometer, for example, is the most versatile yet to be carried aboard an environmental satellite. It is designed to gather and store visible and infrared measurements and images in four channels for later playback. This system will permit more precise evaluaton of land, ice, surface water, cloud conditions, and sea-surface temperatures, at the same time transmitting in real time to users of both the automatic picture transmission and high resolution picture transmission systems located in more than 100 countries around the world.

Similarly, the three-instrument vertical sounder subsystem should give improved temperature readings (within 1 degree C) and moisture data from Earth's surface through the stratosphere. Even if obscured by cloud cover some of this data can be recovered, since one of the three instruments can detect microwave radiation, which is not affected by most clouds.

Responsibility for ground support systems is shared: The U.S. handles acquisition and processing of most of the data through the NOAA Command and Data Acquisition stations near Fairbanks (Alaska) and Wallops Island (Va.), and a central processing system at Suitland (Md.); the *Centre National d'Etudes Spatiales* of France is responsible for the processing and distribution associated with the data collection and platform locations system; and the French meteorological service operates a special readout station in Lannion, France, to gather atmospheric temperature data from the satellite during orbits not visible to U.S. stations.

The Tiros-N system will be a primary source of data for the First Global Atmospheric Research Program, global experiment, an international cooperative project scheduled to begin Dec. 1, 1978 that involves some 140 countries. Its instrumentation payload is designed to meet program requirements for quantitative data of the Earth's atmosphere and sea surface essential to the design of systems that will make possible improved long-range weather forecasts.

The Tiros-N operational system benefits from experience in designing NASA's original Tiros (Television Infrared Observation Satellite) series of 10 research satellite which began with Tiros-1 in 1960. That series of spacecraft went through a number of evolutionary stages until NOAA was satisfied that the spacecraft was ready to be put in operation. The agency then funded its own nine-spacecraft series, beginning in 1966.

NASA launched and funded the Improved Tiros Operational Satellites (Itos), with advances in research and development in 1970 and 1971. Five similarly NOAA-funded satellites were launched from 1970 to the present.

Tiros-N systems draw heavily on instrument technology gained from NASA's Nimbus spacecraft program. The Tiros-N bus is a modified U.S. Air Force spacecraft bus, designed to meet mission requirements and still have a growth capability of 25 percent in payload carrying capability.

Tiros-N was designed and funded by NASA and will be managed during its checkout period (about two months) by the Goddard Space Flight Center, before it is turned over to NOAA. The spacecraft was designed and built by RCA's Astro Electronics Division, Princeton, N.J.

Fifth Spar Rocket Launched

Spar V, NASA's fifth space processing applications rocket, was successfully launched in September from the White Sands Missile Range in New Mexico.

Roger Chassay, manager of the SPAR project at the Marshall Space Flight Center said the flight appeared to go extremely well based on limited data. The rocket flight lasted about 15 minutes and reached a height of around 102.5 statute miles, affording the experiments payload about four minutes of low gravity for processing.

The payload was recovered about 89 to 105 kilometers downrange in a low mountain area on a gentle slope. Chassay said that there was no external damage to the payload. The four experiments were returned to principal investigators for study and reports on results.

The SPAR project, managed for NASA by the Marshall center, is a continuing series of materials processing in space rocket flights. It is part of a larger materials processing in space program, also managed by Marshall, which seeks to develop space materials science and technology in research and manufacturing activities leading toward future space commercialization by private enterprise.

City Manager Receives Gift—Langley director Dr. Donald P. Hearth (right), presents a satellite photograph of the Tidewater (Va.) area to Frank Smiley, Newport News City Manager. While visiting the Langley center on August 14, Smiley and other city officials were briefed on programs such as environmental monitoring, energy conservation and the use of computers. They also toured the V/STOL wind tunnel.

Chemical Clouds Seen Over Northern Europe

About seven days after the Nimbus-G spacecraft was launched into polar orbit by a Delta rocket, two chemicals were released separately from the second stage of the Detla.

The project, known as Cameo (chemical active materials ejected in orbit), involves a single 90-second release of lithium over northern Scandinavia, and a separate release of barium from four canisters over northern Alaska. Cameo was designed for the study of solar energy and plasma flows and electric fields in Arctic regions.

The Delta rocket was placed in a circular orbit similar to the orbit of Nimbus, at an altitude of 965 kilometers. When the lithium was released, a huge bright red cloud was visible for about five minutes from Greenland, Scandinavia and other parts of Europe. When the barium was released, a bluish white cloud was visible for about half an hour from the Soviet Union, Canada and the northwest United States.

Four barium canisters were released at 40-second intervals over northern Alaska on ground command which came from NASA's tracking station at Gilmore Creek, Alaska. Almost immediately, each release created two luminous clouds. One of these, an ionized barium sheet some 1,000 km long, attached itself to the magnetic field and its orbital motion was stopped. The other, a neutral cloud, continued to orbit with the Delta second stage. In time, the bright barium clouds dissipated and moved away from the Earth into deeper space regions. The barium light then became faint, but observable by telescopic camera stations in the U.S. and Hawaii.

The lithium experiment was designed primarily to determine the location of electric fields oriented parallel to the Earth's magnetic field.

Voyagers Safely Pass Asteroid Threat

Voyager 1 exited the asteroid belt in early September, on its journey to Jupiter and Saturn, Voyager 2 in October.

The asteroid belt is a band of rocks and dust 360 million kilometers wide between the orbits of Mars and Jupiter; its inner edge begins about 105 million km from Earth's orbit. At one time scientists believed it might constitute an impassable hazard for spacecraft bound to the outer planets and beyond.

Voyager 1 entered the asteroid belt last December

10, a few hours behind Voyager 2. Voyager 1, launched after Voyager 2, has been flying a faster trajectory, and has been steadily pulling ahead of its companion since overtaking it last December 15.

The speed of Voyager 1 relative to the Sun is 57,400 km an hour. When it left the asteroid belt, the speed of Voyager 2 relative to the Sun was 49,400 km an hour.

Voyager 1 will reach its closest approach to Jupiter on March 5, 1979, when it will pass 286,000 km from the surface of the giant planet. Voyager 2 will pass 643,000 km from Jupiter July 9, 1979.

Both spacecraft will continue on to the ringed planet Saturn. Voyager 1 will arrive in November 1980, flying within 4,022 km of the surface of Saturn's largest satellite, Titan. Voyager 2 will arrive at Saturn in August 1981. Voyager 2 has the option of continuing on to a January 1986 encounter with the planet Uranus.

Voyager 2 was launched from Cape Canaveral, Fla., August 20 1977. Voyager 1 was launched September 5, 1977.

JPL manages the Voyager project for NASA's Office of Space Science.

NASA Satellite Monitored Desert Expedition in Egypt

A joint United States and Egyptian geological expedition across Egypt's desolate Western Desert relied on NASA satellite tracking signals and space imagery of the area to map the route and test sites. During the two-week trip, Sept. 25-Oct. 8, the Nimbus-6 research satellite monitored beacon signals from the expedition and reported its location to the Goddard Space Flight Center.

According to Dr. Farouk El-Baz, chief scientist of the expedition, existing maps provide only limited coverage of the area of interest to the expedition. El-Baz is research director of the Center for Earth and Planetary Studies at the Smithsonian Institution's National Air and Space Museum.

El-Baz selected the Egyptian desert as a study site because of the similarity between that area and the Martian deserts as revealed by space photography from NASA manned and unmanned space flights.

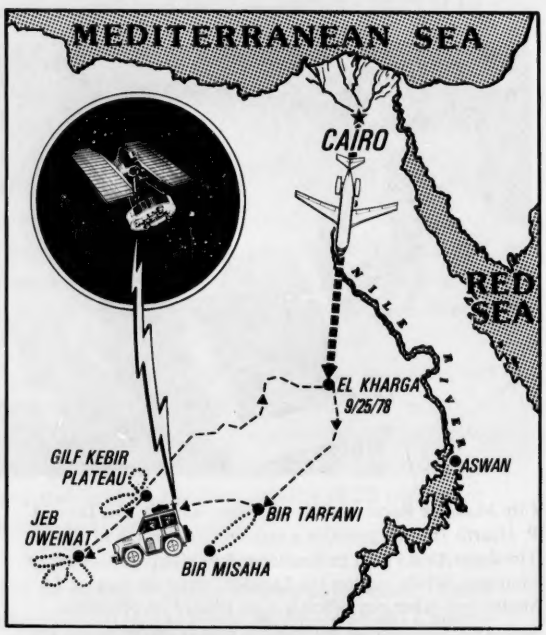
"The Western Desert of Egypt and the deserts of Mars have similar climatic and surface feature characteristics. Correlations between the two desert areas shed light on the wind transport of eroded materials in both cases," said Dr. El-Baz.

Understanding the laws of sand movement and dune growth are considered vital by El-Baz and others studying the subject. Deserts constitute a fifth of the land masses of the Earth and are yearly encroaching on man's fertile soil. Tunisia, for example, in recent history has lost about half of its arable land.

"We are now at a stage where we must acquire a better understanding of the desert environment and of the ways and means to tame it, lest more area of the Earth become wastelands. One tool at our disposal is photography from space," said El-Baz.

A special photographic mosaic of the Oweinat Mountain region in the Egyptian desert was prepared by Goddard scientists for the expedition. The expedition's route and areas of test activity were plotted on this mosaic, using the satellite-derived positions which are accurate to several miles.

Imagery for the mosaic was produced by the Landsat Earth resources satellite whose sensors scan the surface of the entire Earth once every 18 days, cloud cover permitting. Resolution of this imagery is sufficient to identify objects about one acre in size. Landsat imagery is used by scientists around the world to study global problems such as food production, location of new metal and fossil fuel supplies, and environmental degradation.



NIMBUS—6 TRACK EGYPTIAN DESERT EXPEDITION

The principal test site for the expedition was the Oweinat Mountain area which fell at the halfway point of the 1,600 km desert trek.

"It is here that we find the surface streak and sand dune features that are most familiar to Mars," said Dr. Ted A. Maxwell, a geologist in the Smithsonian's Center for Earth and Planetary Studies. He added: "We also know that this area was arable land about 3,000 to 4,000 years ago and that people lived here. Shepherds left their mark on the mountainsides in the form of rock art, or painted pictures."

In addition to El-Baz and Maxwell, the American members of the research team included three geologists from the U.S. Geological Survey and an archaeologist. They were joined by geologists from Ain Shams University in Cairo and the Geological Survey of Egypt.

Support for the desert research project was provided by NASA's Planetary Geology Program and the Smithsonian Foreign Currency Program.

The satellite beacon carried by one of the expedition jeeps is a compact, 4.5 kilogram unit, battery-operated. It automatically transmits a one-second signal every minute. Longitude and latitude positions are computed using the apparent frequency shift of the successive signals received by the Nimbus-6 as it passes overhead.

The beacon originally was developed for use aboard constant level weather balloons in the tropics to derive wind velocity. Other meteorological data such as temperature, humidity, and barometric pressure were relayed from sensors attached to the beacon.

Today, the beacons are used extensively on buoys to track ocean currents for oceanographic and environmental impact studies around the globe. One study in the Gulf of Alaska is intended to aid in the selection of the safest sites for offshore oil rigs where leaks are always a potential hazard. The U.S. Coast Guard places the beacons on icebergs to help track their drift routes in the Greenland and Labrador areas for the International Ice Patrol. Animal researchers have compacted the beacon and fashioned it into a collar to track several polar bears in the Arctic. Long-term data on the continuous movement of polar bears contributes to a better understanding of the Arctic's ecology. Others are tracking sharks released off the coast of Europe.

Japan's Naomi Uemura, first man to walk to the North Pole and then down the icy spine of Greenland alone, carried one of the beacons on his dogsled for scientific and possible search and rescue purposes.

The beacon played a key role in helping locate two American areonauts attempting to cross the Atlantic Ocean in 1977. New Mexico balloonists Maxie Anderson and Ben Abruzzo credit the beacon with helping save their lives when they became lost in a major snow storm with all other communications equipment out of order.

Anderson, Abruzzo, and a third balloonist, Larry Newman, carried two Nimbus-6 beacons on their second and successful attempt to cross the Atlantic this past August.

Balloonists Recognize NASA Help—New Mexico aeronauts Ben Abruzzo (left) and Maxie Anderson, first men to cross the Atlantic Ocean in a free flying balloon, shake hands with Ralph Shapiro (right), Goddard's Nimbus control manager. The occasion was their visit to the Nimbus control center at the Goddard center to thank the people there who helped save their lives last year. The Nimbus satellite tracked the balloonists across the Atlantic last year when they became lost in a storm and nearly perished until the satellite pinpointed their location for rescuers. Nimbus also tracked Abruzzo and Anderson, along with a third aeronaut—Larry Newman—this past August when the trio successfully crossed the Atlantic in an historic first.

This is the sixth in a series of profiles of NASA field centers.

White Sands Test Facility, Las Cruces, New Mexico

A great many NASA employees are unaware of, have forgotten about, or are unfamiliar with current programs being carried out at this low-profile establishment. It is, nonetheless, an important member of the NASA family.

Some 700 air miles to the west of the 1,620-acre Johnson Space Center stands a NASA outpost, the immense (87 square miles) White Sands Test Facility. It is located at Las Cruces, N.M., on the western slopes of the San Andres mountain range.

Driving east on U.S. route 70 from Las Cruces, the unprepared traveler might do a double-take as he sees the roadside sign advising "next left" for NASA's Johnson Space Center. That "next left" dips for another six miles across desert arroyos until it reaches the WSTF administrative buildings. The base is under the direction of JSC; its manager, Jesse C. Jones, reports to Johnson center director Dr. Christopher C. Kraft, Jr.

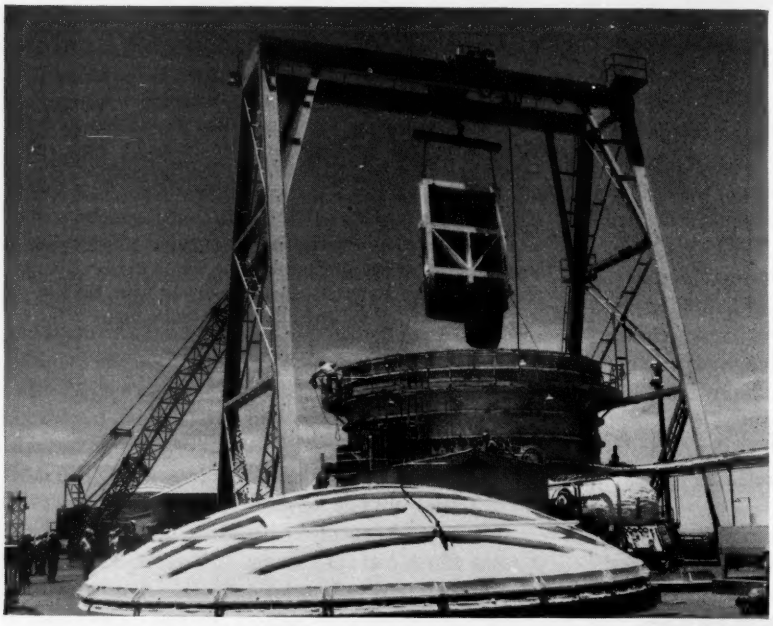
The facility, because of its remote location, offers an ideal location for the testing of propellants and other hazardous chemicals.

"We have no environmental limits for testing Shuttle systems," said WSTF technical manager Louis Gomez. "We recently added seven square miles of buffer along the western boundary of the facility as we saw various types of land use creeping our way from the city of Las Cruces."

Valued at $75 million in 1973 dollars, WSTF was designed for operation by 1,000 people, although current facility population is 670. Of these, only 74 are NASA employees. Most of the remainder are Lockheed Electronics employees on the facility maintenance and test operations contract. Rockwell International and McDonnell Douglas have people at WSTF for orbiter maneuvering and attitude thruster testing.

Manager Jones sees the facility as not only a place to test equipment and materials for JSC, other NASA field centers and government agencies, but also as a national resource for such testing.

Owing to its location in the boondocks, there is hardly anyone to complain about the noise when a rocket engine lights off in the WSTF propulsion test area. In August, the test stands held a test version of the orbital maneuvering subsystem (OMS) pod, (delivered in early July), and forward and aft orbiter reaction control subsystems. The OMS engines are rated at 6,000 pounds thrust. Steam ejectors can pull a vacuum of 120,000 feet equivalent altitude in two of the propulsion test chambers to allow engines to



Pit and Pendulum—A test article orbital maneuvering subsystem pod is lowered into a White Sands test chamber as preparations were made for vacuum test firing of the OMS.

be fired in a near-space environment. Liquid oxygen and alcohol are fed to three modified X–15 type rocket engines and the plume quenched with water to provide high-velocity steam to aspirate the altitude chambers.

Not all WSTF work is noisy. In another lab complex, samples of candidate materials and substances for space application are quietly burned, stretched, pounded, heated, immersed and otherwise assaulted to find out whether they can take such punishment.

"We test the materials for their responses and make no comments of whether or not they 'pass'," says materials test lab manager Jack Stradling.

A minimum of three tests is run on each sample. Some tests are for flame propagation in pure oxygen at varying pressures, while other test set-ups may be for flash-points and impact ignition.

"Some type of materials testing call for an initial series of 20 tests. If in that 20 there is one failure, 40 more tests are run with one failure out of 60 being acceptable," said Stradling. Some data collected form the WSFF tests eventually go into the *Materials Data Handbook* published by the Johnson center's nonmetallic materials information center.

Two rows of thick-walled test cells outside the materials test lab are used in tests of propellants and other hazardous fluids. One of the typical tests the facility is called upon to run is the decomposition of hydrazine monopropellant in reaction to groups of other materials used in the orbiter auxiliary power unit. Small quantities of hydrazine and a test material are placed in baseball-sized containers and the temperature heightened in the test cell to simulate the unit's start-up and shut-down cycles and the resulting heatsoak through feedlines and tankage.

Another building in the same complex at WSTF houses the chemistry laboratory where trace materials in gases and fluids is analyzed by using a mass spectrometer in conjunction with a gas chromatograph. Once a substance is analyzed, constituents are displayed numerically in a computer printout or in a line graph form. Machines go only so far in the chem lab, for after a substance is determined to be non-toxic, teams of WSTF volunteers make subjective "sniff tests" of samples and a consensus of the odor is duly entered in the test report. Prior to sniffing a sample, each volunteer's nose is "calibrated" through sniffiing unmarked specimens of known characteristics. Chem lab chief Leonard Schluter said that while many of the tests run in his lab follow standard practice, many others have no standards to follow—particularly among the more exotic materials and fluids.

When the tracking and data relay satellite (TDRS) network is on station in geosynchronous orbit for the Shuttle space transportation system, a new ground station at White Sands will be the collecting point for data and voice to and from orbiters and other spacecraft.

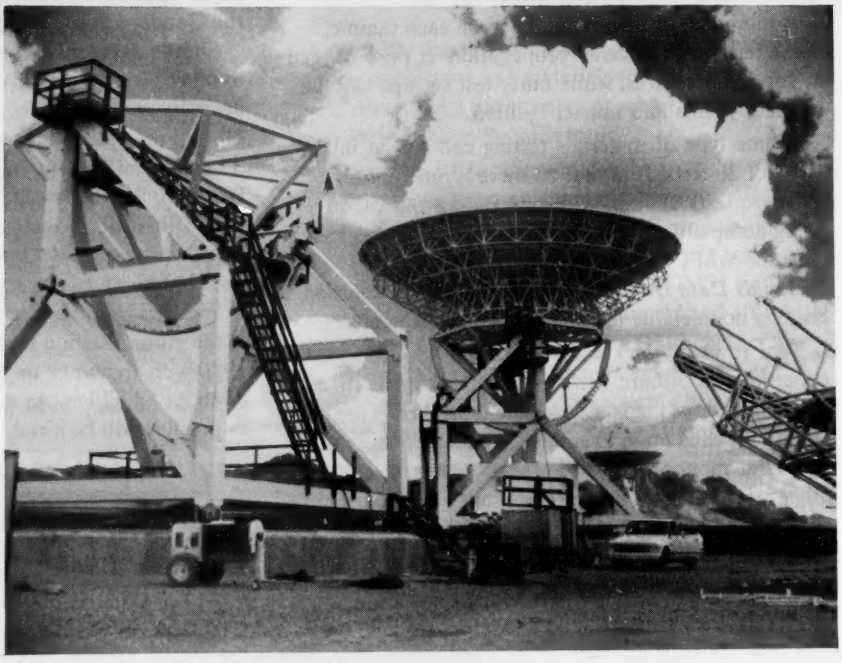
Three 60-foot diameter TDRS antennas and a control center/support building are under construction just south of the WSTF administrative area. The $4 million ground station is being built and will be manned by Western Union under a contract to the Goddard Space Flight Center.

Shuttle data and voice will be relayed from WSTF to other geosynchronous satellites and bounced back again by an adjacent RCA ground station to the two 30-foot diameter RCA dishes that lie between Bldgs. 32 and 9 at JSC, and thence to Mission Control at Houston. Parked at 41° W Long and 171° E Long, the TDRSs will give almost continuous coverage of Shuttle orbiter except for a brief loss-of-signal patch over India.

Western Union expects to have about 100 people at the ground station when it becomes operational in 1980 with an annual payroll for the Las Cruces area of about $2 billion. As many of the company's staff as possible will be hired locally.

Burning Rubber—Mike Mannon and Frank Melendrez monitor an upward propagation burn test in 30 percent oxygen of a swatch of fluorosilicone rubber in one of the small chambers of the WSTF materials test lab.

The Nose Knows—Ernie Ceroky tries to make up his mind as to what odor is given off by a chemical sample as Nancy Berry watches. Subjective impressions of smell become a part of lab reports.



An Ear to Space—No singing telegrams will pass through these Western Union ground station antennas for the Shuttle tracking and data relay satellites at WSTF. The 18-meter dish is mounted on the structure in background and the dish for the near antenna mount is being assembled at right.

Shuttle Main Engine Testing Achieves Major Milestone

A flight-configured developmental Space Shuttle engine has exceeded 5,000 seconds in test firing at NASA's engine test facility in Bay St. Louis, Miss. This is significant because the mark is the same one a production must meet to guarantee certification of the Space Shuttle main propulsion system for manned flight.

Space Shuttle main engine testing, both in the number of tests and time accumulated, has increased dramatically since Aug. 12, 1978. In that period, some 7,100 seconds of testing time have been accumulated on two engines, bringing the total engine testing time to more than 25,000 seconds in 342 tests.

Full duration testing of the complete main propulsion system, a cluster of three engines, is scheduled to resume in early 1979 when the first manned orbital flight configuration engines become available.

JSC Given Engineering Award

Johnson Space Center was named winner of the 1978 Government Professional Development Award presented annually by the Texas Society of Professional Engineers. JSC is responsible for all manned space flight activities except launch operations. Currently, the center is responsible for the development of the Space Shuttle program.

TSPE President C.L. Kidwell of El Paso presented the award at a special luncheon on Sept. 15, in Austin. The engraved plaque recognizing the Johnson center as "the federal government unit in Texas which has made the most outstanding contribution to the advancement and improvement of the engineering profession through its employment practices" was accepted by Dr. Maxime A. Faget, director of engineering and development.

The award is rotated annually among federal, state and local levels of government. Competition this year was limited to federal governmental units.

TSPE, headquartered in Austin, is the largest state professional engineering society in the nation, representing some 7,000 professional engineers in Texas. JSC was nominated by the Bayou Chapter of TSPE, and was selected for the award by a committee of the Professional Engineers in Government division of TSPE.

As winner of the 1978 TSPE award, the Johnson Space Center was nominated by Texas for the National Society of Professional Engineers 1979 Government Professional Development Award.

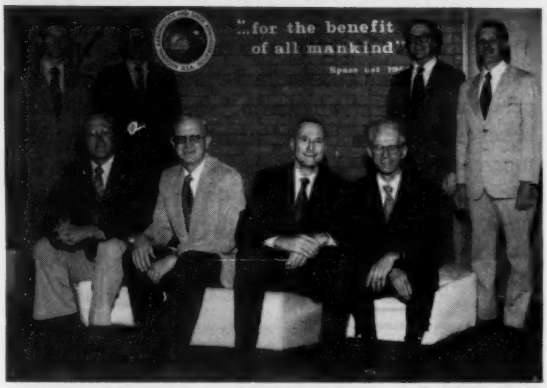
Lewis Wins Five of the "Best New Product" Awards

The Lewis Research Center is one of the top winners in this year's national "I-R 100" competition, which honors the "100 most significant new technical products of the year." In this year's 16th annual "I-R 100," sponsored by Industrial Research/ Development magazine, the Lewis center won five of the 100 awards, second only to the General Electric Co., which won seven.

The 100 awards were presented at a dinner ceremony on Sept. 21, in Chicago at the Museum of Science and Industry.

Over the 12 years that the Lewis center has participated in the "I-R 100" competition, the Cleveland facility has won 26 awards. In 1978, Lewis award winners and their developers are:

Award Winners for Products—"I–R 100" Award Winners at the Ames center are (front, l. to r.) Gale R. Sundberg, Robert L. Miller, John C. Freche, Walter R. Witzke; (rear l. to r.) Gerald V. Brown, William J. Waters, Burdell L. Detterman, and Joseph R. Stephens.



A voice output solar energy reporter, a device that automatically obtains daily measurements of locally available solar energy and reports the information on request over a commercial telephone line. The system is designed for users who can knowledgeably interpret the measurements, such as weather reports. The system was developed by Robert L. Miller and Burdell L. Detterman.

A high efficiency practical magnetic heat pump that promises potential savings in energy and other operating costs for commercial and industrial heating and cooling applications, developed by Gerald V. Brown.

A strength enhancement fabrication process for prealloyed powdered superalloys that can greatly increase material strength at high temperatures (480°C–640°C) The process, which also promises reduced fabrication costs, was developed by William J. Waters and John C. Freche.

A new silicon, high-power switching transistor, entered jointly with Westinghouse Electric Corp. The transistor introduces a unique combination of increased power handling capability, unusually low saturation and switching losses, and submicrosecond switching speeds. Present uses for this new transistor already include high frequency inverters and power switching regulators, linear amplifiers, rf induction heaters and motor controls for actuators and vehicle drives. Potential new applications are kitchen ranges and electronic scalpels for medical surgery. Lewis developers were Gale R. Sundberg and J. A. Kish. The Westinghouse team includes Dr. P. L. Hower, C. K. Chu and D. C. Carnahan.

Low temperature alloys, one of which is a low chromium stainless steel offering the potential of conserving one-third the chromium (a critical U.S. metal) currently used in producing comparable commercial stainless steels. Possible uses include heat exchangers, cryogenic containment vessels and automobile trim. The other is an iron alloy with the highest combination of strength and toughness at cryogenic temperatures of any known alloy. Potential uses are in liquefied natural-gas storage, structural support in superconducting machinery and welding rods for other alloys. These alloys were developed by Lewis employees Joseph R. Stephens, Charles A. Barrett, Charles A. Gyorgak and Walter R. Witzke, and by Wayne Y. Chen of Purdue University.

Simokaitis Appointed Chief of DoD Affairs Division

Frank J. Simolaitis (Maj. Gen., USAF, Ret.) was appointed director of the DoD Affairs Division of NASA's Office of External Relations.

From 1973 until his retirement this year, Simokaitis was Commandant of the Air Force Institute of Technology at Wright Patterson Air Force Base, Ohio and, concurrently from 1976, Commandant of the Defense Institute of Security Assistance Management.

During World War II, Simokaitis served as an instructor pilot and a bomber pilot in the European theater. Subsequently, he served in a series of Air Force operations: special investigative, legal, planning, administrative and staff posts including Executive Assistant to the Secretary of the Air Force from 1969 to 1973.

His decorations include the Air Force Distinguished Service Medal; Legion of Merit and Air Medal; the Order of Daedalions; General Muir S. Fairchild Educational Achievement Award; and the St. Louis University Alumni Merit Award.

Born in St. Louis, Mo., in 1922, he attended Washington University in St. Louis from 1945 to 1947. He received his LL.B. and J.D. degrees from St. Louis University in 1950 and 1970, respectively. He is a member of the bar of the State of Missouri and has been admitted to the practice of law before the U.S. Supreme Court and the U.S. Court of Claims.

Patton Wins Test Pilot Award

James M. Patton, Jr., head of the pilots' office at NASA's Langley Research Center, was presented with the Iven C. Kincheloe Award at the annual symposium of the Society of Experimental Test Pilots in Los Angeles on Sept. 30. The award recognized his professional accomplishment in the initiation, formation, and conduct of the NASA comprehensive general aviation stall/spin flight research program.

Patton was nominated for the award by John P. Reeder, chief of Langley's terminal configured vehicle program Office, and a society fellow. In his nomination, Reeder noted, "During the [stall/spin] program formulation, Mr. Patton provided invaluable leadership and technical guidance to establish flight safety procedures and ensure a rational and productive flight research program. As a result of his efforts, Langley has established a stall/spin flight test facility, procedures, and equipment which provide the most sophisticated system to date for general aviation stall/spin research."

Patton has been in his present position since 1968; he began his NASA career in April 1966 as a research pilot. Before joining NASA, he was an engineering test pilot with the Federal Aviation Administration from 1958 to 1966. From 1956 to 1958, he was a flight test engineer with the Chance Vought company in Dallas. He served in the U.S. Navy from 1946 to 1953 where he held the rank of lieutenant commander.

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NASA Engineer Chosen for Presidential Exchange

Larry D. Pinson, an aerospace engineer at the Langley Research Center is among a select group of mid-career executives chosen for participation in the President's Executive Interchange Program.

Designed to foster improved relations between the private and public sectors, the program selects 50 to 75 high caliber middle management executives from both sectors each year for this unique interchange. Each executive spends the year in the opposite sector gaining in-depth, on-the-job experience.

Pinson will spend his interchange year with the Aerospace Corp. in Los Angeles, Calif.

The program seeks fast-paced, self-motivated executives who have demonstrated top management potential. To meet the program goals, all nominees are personally approved by the chief executive officer of the private sector organization or the head of the sponsoring federal department or agency.

"Beneficiaries of the program include not only the executives and the participating organizations, but the Nation as well," said Lee Cassidy, Executive Director of the President's Commission on Personnel Interchange, which administers the program.

"In achieving its objectives, the Program provides the Nation with a cadre of promising individuals in both sectors who can be called upon in later years for government advisory posts and important appointive positions," he added.

The 67 men and women selected for this year's program bring the total to over 450 highly qualified executives who have participated in the interchange program since it was established by former President Lyndon B. Johnson.

Pinson holds a B.S. and an M.S. in civil engineering from the University of Kentucky, Lexington, and a Ph.D. in engineering mechanics from the Virginia Polytechnic Institute and State University. In 1963, he joined the Langley center. Pinson has received several awards for work on vibration of space vehicles and, during the Apollo program, was a consultant on various flight anomaly studies.

Hubbard Receives Acoustics Award

Dr. Harvey H. Hubbard, assistant chief, acoustics and noise reduction division at the Langley Research Center recently received the Acoustical Society of America's Silver Medal (Noise).

The society, consisting of 5,000 professionals in all phases of acoustics, presents no more than three Silver Medals a year and each medal must be in a different field.

Hubbard received the award "for his contributions to the understanding of aircraft noise, its generation, propagation and control, and its effects on people and structures." The award was presented in Honolulu.

Hubbard, the author or co-author of about 90 technical papers on research in acoustics, has been with Langley since October 1945.

Hubbard has contributed chapters in various publications, co-authored three chapters in the book entitled "Technical Aspects of Sound," co-authored a chapter in the recently published "Handbook on Shock and Vibration," and co-authored articles on sonic booms and aircraft noise in the McGraw-Hill Science Encyclopedia.

Heyman Wins Industry Magazine Award

Dr. Joseph S. Heyman, a physicist at the Langley Research Center, recently was given his third IR–100 award by Industrial Research Magazine for helping develop one of the 100 most significant new technical products of 1978. This marks the first time a single individual has been selected three times by the magazine for research work. His previous awards were in 1974 and 1976. Heyman is a member of the Langley instrument research division.

The 1978 device he helped to develop in a joint project by Langley and Washington University in St. Louis, is called an acuostoelectric transducer. It greatly improves the accuracy of measuring the exact properties of various materials that emit very high-pitched sound waves. The advantage of the acousto-electric transducer over conventional transducers is its insensitivity to the shape of sound waves. New information provided by the device will allow researchers to more accurately identify and evaluate material flaws and to characterize biomedical specimens and tissue.

Elementary School Named after Enterprise

The Woodbridge, Va., Enterprise Elementary School was formally dedicated on Sept. 8, with a ceremony which included a former astronaut, U.S. Senator Jack Schmitt (R–N.M.); NASA's Curtis M. Graves, chief of community affairs; and a host of county and city officials. Naming the school of some 838 students after the Space Shuttle *Enterprise* was a suggestion by third-grader Mark Pioli. The school principal, Charles Ricks, said the school's nine hallways would be named after NASA astronauts. NASA gave the school a photo of nine different astronauts as well as a large photo of the *Enterprise* landing in California after one of its successful tests. An exhibit of the Space Shuttle is on loan to the school for the rest of the year.

Enterprising Elementary School—Mark Pioli (right) proposed that his school be named after the Space Shuttle *Enterprise*. Mark is holding a poster made by him and other members of his third-grade class. From left to right are Lisa King, Kim Havis, Fred Sort and Mark Eiven.

Unusual Satellite Data Suggest a Black Hole

Data from an American-British-European satellite, the International Ultraviolet Explorer, suggest the possibility of a massive black hole (see glossary) at the center of some groups of stars in our galaxy called globular clusters. Six of these clusters, three of them X-ray sources, have been the subject of close examination by a group of scientists headed by Drs. Herbert Gursky and Andrea Dupree, both of the Harvard-Smithsonian Center for Astrophysics at Cambridge, Mass.

IUE was launched by NASA into a modified synchronous orbit near the equator last January, in cooperation with the European Space Agency and the British Science Research Council, to study a wide range of celestial objects in the ultraviolet, one of the most important regions of the electromagnetic spectrum.

Gursky says the onboard ultraviolet instrumentation provided surprises for him and his colleagues by being able to penetrate the background denseness of the clusters 15,000 light years away (a light year means 9.5 trillion kilometers, the distance light travels in one year) so they could actually see to the core.

What they see there, according to Gursky, is probably radiation from a group of 10 to 20 bright blue stars that orbit the core. He said: "These stars may well be orbiting a massive black hole the size or mass of one thousand solar systems." But he emphasized that the existence of a black hole is by no means certain; the dynamics of the stars must be studied first to see how they rotate in relation to the center of the million-star cluster. This may give a better indication of what provides the necessary gravitational pull that holds them in orbit. If the stars are indeed orbiting a massive black hole, Gursky believes they are right on the edge of it. If not, they may be providing their own gravitational equilibrium.

What surprised the observation team, according to Gursky, was the fact that the shortwave length instrumentation could so clearly cut through the million-star cluster. He said: "For the first time we are seeing in a clean way the center or core of those globular clusters and we were surprised. You can see the clusters in visible light. There are lots of red giant stars there, which mask what is going on in the center. Now we have a tool, IUE's shortwave ultraviolet, capable of going for the first time right to the core through the whole cluster."

Gursky says they will continue to observe the six globular clusters, which are like miniature galaxies, but he believes they won't get a definite answer until NASA's space telescope is placed in orbit from the Space Shuttle in 1983. The telescope will be able to use much more powerful instrumentation, including the short wavelength of the ultraviolet spectrum, to study the blue stars in more detail.

Whether massive black holes are indeed at the center of the clusters is an open question, but astronomers generally agree that the concept of black holes helps them explain puzzling phenomena in the universe that cannot be explained in any other way.

For example, how else explain the dynamics of the strong X-ray source, Cygnus X–1, a binary star system composed of a visible and invisible companion star? The X-rays are generally interpreted as coming from the system as the result of a companion star, a black hole that is compressing material from the visible star's atmosphere before it completely disappears into the black hole. The Cygnus X–1 black hole was estimated to be 10 times the mass of our Sun, but less than one millionth of its diameter.

A paper on the Gursky team results was given at a meeting of the American Astronomical Society at the University of Wisconsin in Madison, last June, by Dr. L. W. Hartmann of the Center for Astrophysics. Other members of the investigating team are: Dr. J. H. Black, University of Minnesota; Drs. R. J. Davis and J. C. Raymond, both of the Center for Astrophysics, and Dr. T. A. Matilsky of Rutgers University.

The Goddard Space Flight Center is responsible for the design, integration and testing of IUE, and provides the U.S. ground support facilities. ESA built the solar array and the Madrid ground facilities. Britain's Science Research Council, in collaboration with University College, London, provided the four television camera detectors for transforming the spectral displays into video signals for transmission to the ground.

Astronomical Glossary

Black Holes

Believed to be the final stage in the collapse of a dying star that was massive. The material of the collapsed star is so densely packed—even more so than that in a neutron star—and the gravitational force so great that even light waves cannot escape from the surface of a black hole. All external evidence of its presence disappears. Because black holes emit no light or other radiation, their existence—predicted by the laws of relativity—cannot be confirmed by direct observation, but it can be inferred. Astronomers have identified a powerful X-ray source in the constellation Cygnus. Some suspect that the source, labeled Cygnus X–1, may be just such a black hole.

Globular Clusters

Globular clusters in effect are miniature galaxies, each containing tens of thousands of tightly packed stars. They are found outside the plane of the galactic disk in the surrounding region of space known as the galactic halo. Our galaxy contains at least 150 globular clusters, scattered at random throughout the spherical volume of the halo. All globular clusters are believed to be very old, nearly as old as the galaxy. According to one theory, the globular clusters were the first stars to appear in the galaxy, but were left outside the disk as the parent cloud from which our galaxy was formed contracted. Since the galaxy is believed to be about 10 billion years old, that also must be the age of the globular clusters.

Pulsars and Neutron Stars

Discovered in 1967, pulsars emit radio signals whose pulsations are extremely precise. The evidence suggests that pulsars are fast-spinning neutron stars, compact bodies of densely packed neutrons (atomic particles having no electric charge), believed to form when a large star burns up its fuel and collapses. Containing the mass of a star in a sphere 16 kilometers in diameter, they are so closely packed that a spoonful of material from the center would weigh a billion tons. A neutron star, or pulsar, has been located in the center of the Crab Nebula, a glowing cloud which is still expanding from a supernova reported by the Chinese in 1054.

Red Giant

An aging star approaching the end of its life is called a red giant. The beginning of the end comes when the star has exhausted much of the hydrogen near its core and starts to burn the hydrogen in its outer layers. This process causes the star to gradually turn red and swell to 100 times its previous size, pouring out prodigious amounts of energy. Betelguese in the constellation Orion, visible without telescopic aid, is such a red giant. What happens after its hydrogen is consumed depends on the size of the star.

A small star contracts and becomes a white dwarf. A large star becomes a supernova, blowing its substance into space.

First Winner of Hughes Helicopter Award

NASA's John F. Ward was chosen as the first winner of the Howard Hughes Trophy for "Outstanding Achievement in Helicopter Technology." Ward has been with the headquarters office of Aeronautics and Space Technology since 1974, as program manager for the joint NASA-Army rotor systems research aircraft and tilt rotor research aircraft.

The handcrafted silver and gold trophy was presented to Ward at an American Helicopter Society banquet in Washington, D.C. Thomas R. Stuelpnagel, president of Hughes Helicopters, in presenting the award for AHS, said:

"Two lines engraved on the trophy describe the long and distinguished career in aviation of Mr. Hughes: 'His Vision Formed the Concept. His Courage Forged the Reality.' So it is fitting that the only trophy bearing Mr. Hughes' name will be awarded annually by the American Helicopter Society for the advancement in fundamental helicopter technology . . . it is appropriate that the board of directors has selected John Ward to be the first recipient.

"He has been a major contributor to the advancement of helicopter technology for nearly 20 years, and his most recent project, the fabrication and successful flight testing of the OGEE rotor tip, which he invented, is an outstanding example of his leadership in fundamental helicopter research."

Ward served for some 22 years at the Langley Research Center, first as an aerospace research scientist, then as assistant chief of the Langley flight research branch. He won Langley's Special Achievement Award in 1972 for his work in rotorcraft research. Ward is the author of some 21 technical papers.

Helicopter Expert Honored—John F. Ward (second from left, wearing eyeglasses) receives first Howard Hughes Trophy for helicopter technology advances. At far left of photo is Thomas R. Stuelpnagel; at Ward's left (right of picture) are Rea Hopper, Vice President of the Hughes Company's Summa Corp., and Charles Ellis, Chairman of the AHS Awards Committee.

NASA Picks Gamma Ray Experiments

NASA tentatively has selected five scientific experiments for its Gamma Ray Observatory, a mission planned for 1984 and designed to explore the world of gamma rays—the most energetic form of radiation known. The Earth-orbiting observatory will combine instruments for the detection of gamma rays in a variety of forms—very high energy gamma rays from pulsars, nuclear gamma rays and gamma ray bursts.

Information returned is expected to provide a much deeper understanding of the nature of supernovas, pulsars, quasars and radio galaxies, the character of the universe early in its evolution, and the possible existence of antimatter in the universe. Scientists hope to learn more about the state of incredibly dense matter which makes up such objects as neutron stars—matter so compressed that a teaspoonful of it would weigh millions of tons. The data may shed more light on the nature of mysterious gamma ray bursts, erratic pulses of gamma rays that appear every month or so and flash across the solar system.

NASA officials emphasize that the observatory has not yet been approved by Congress, but early solicitation of scientific participants and investigations allows for mission definition and a prompt start when and if approval is received.

Like X-rays, gamma rays are a form of electromagnetic radiation (photons) as is ordinary light, but with extremely high energy and correspondingly short wavelength (less than 10–11 centimeters). At maximum strength, a gamma ray unit packs several million times as much energy as a unit of visible light. But unlike X-rays, which are typically emitted by hot gas, gamma rays are believed to come from the core of the phenomenon, produced by special nuclear processes. Gamma-ray astronomy allows scientists to investigate these special processes.

Because of their basic nuclear character, gamma rays became known—after World War II—as perhaps

the most important single kind of space research that could be undertaken. But until recently, all astronomy observations were of atoms, ions and molecules and their emissions. A long program of balloon research proved rather disappointing, with only hints that gamma ray sources were being detected. Then a small experiment on an Orbiting Solar Observatory detected the first certain gamma rays, a find that gave scientists the confidence to launch, in 1972, the Small Astronomy Satellite 2 with a small detector for very high energy gamma rays. This spacecraft, along with COS B (1975) and the first High Energy Astronomy Observatory, provided the basic data which will be exploited by the more powerful planned observatory.

Dr. Noel W. Hinners, NASA Associate Administrator for Space Science, said: "We are now in a position to move forward and reap the benefit of this long effort. With the Gamma Ray Observatory, we will usher in the era of nuclear astronomy. We will have a powerful probe of the high energy universe."

The observatory will be managed by the Goddard Space Flight Center. It will be carried into a planned orbit of 400 to 500 km by the Space Shuttle. Launch will be from Cape Canaveral. The planned altitude was chosen to be as low as possible, consistent with a minimum two-year design lifetime.

Scientific investigations selected by NASA and the principal investigators for each are:

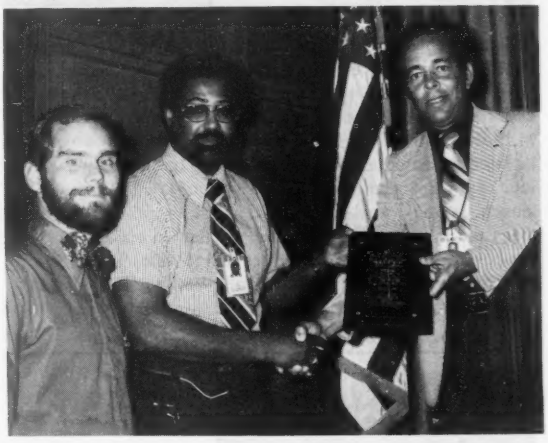
Broad Line Gamma Ray Spectrometer—principal investigator Dr. James D. Kurfess, of the Naval Research Laboratory. This instrument will perform detailed space and time studies of intermediate energy gamma-ray sources, including gamma-ray bursts, solar flares and sources of broad line emission.

Narrow Line Gamma Ray Spectrometer—principle investigator Dr. Laurence E. Peterson, University of California at San Diego. This instrument will measure gamma-ray line intensities, continuum spectra and their time-varying objects, and the diffuse galactic and extragalactic diffuse emission.

High Energy Gamma Ray Detector—principal investigator Carl Fichtel of the Goddard Space Flight Center. This is a telescope to search for discrete gamma-ray sources and measure their intensity, spectrum, position and time variability. The telescope also will obtain better positions for known sources, and will study the spectrum and structure of the high-energy, diffuse galactic emission and isotropic diffuse background.

Medium Energy Double Compton Telescope—principal investigator Dr. V. Schoenfelder of the Max Planck Institute for Extraterrestrial Physics, Garching, Germany. This instrument will study the spectrum and time variability of medium-energy point sources, investigate the diffuse galactic emission and isotropic diffuse flux in this energy range, and search for broadened line emission from both point and diffuse sources.

Transient Gamma Ray Monitor—principal investigator Dr. Gerald J. Fishman of the Marshall Space Flight Center. This experiment will measure the frequency-versus-size distribution of gamma ray bursts, provide single-station burst locations to within several degrees and precise timing of stronger bursts to obtain arc second positions (in conjunction with other satellites), measure variations in intensity and spectrum of bursts and other transient events with a time resolution of 0.1 miliseconds, and continuously monitor the stronger X-ray and gamma ray sources for transient phenomena.



Small Business Award—Dryden center director Ike Gillam presents a Small Business Administration award to Dryden procurement chief Larry Rucker and Small Business officer Mark Kilkenny. Dryden awarded more than $6 million to small business firms and exceeded its minority contracts goal of $1.5 million last year.

A Remarkable Story—Mike Harper, an 11-year-old Tampa youth, displays the certificate presented him by Lee R. Scherer, director of the Kennedy center, declaring him an honorary KSC patrolman. NASA Deputy Administrator Alan M. Lovelace holds the Space Shuttle landing photo which he later presented to Mike. The boy was treated to a special tour of the Spaceport, including a view of the ISEE–3 launch, during a weekend at KSC with his mother. Government and the community worked together to make sure that the boy enjoyed all that the center had to offer. Mike lost both feet several months ago when he was struck by a train while rescuing his puppy.

Chinese Journalists at Space Center—Director Tseng Tao of Hsinhua, the New China News Agency (left) meets JPL director Dr. Bruce Murray at the start of a three-week tour of the United States. Dr. Ta-Jin Kuo of JPL acted as interpreter for the Chinese group.

Contractor News

Unified Services, Inc. of Washington, D.C. has received a $2.3 million contract from the Kennedy center for custodial services, including janitorial, trash and garbage disposal, and clean-room services. The cost-plus-fixed-fee contract extends from September 1978 to August 1981. In addition to the first year award, the contract includes a second-year priced option of $2.4 million, and a third year unpriced option. Overall value of the three-year contract is estimated at $7.6 million. The contract is set aside for disadvantaged firms under a Small Business Administration program.

Airborne Instruments Laboratory Division of Cutler-Hammer, Long Island, N.Y., has been selected by NASA for negotiation of a contract to provide an adaptive multibeam phased array instrument as a communications experiment to fly on the Space Shuttle. Estimated cost of this cost-plus-fixed-fee contract is $3.6 million. Delivery is to be within 24 months after contract signature. The term multibeam applies to an antenna system which can operate on more than one circuit at once—it can receive and transmit two or more circuits simultaneously. "Phased" denotes the electronically steering to control the direction of the signal. A major distinguishing feature of the AMPA is its ability to form and steer more than one independent beam which automatically acquire and track desired signals while rejecting interference. This is a highly versatile antenna system offering many potential applications in both geostationary and low altitude orbits. Its high-gain feature would enable communication with low-power terminals. The potential applications include point-to-point communications, data collection, emergency aid, search and rescue, weather observation, oceanography, and remote monitoring, in which the AMPA antenna system would function as a communications satellite receiving and/or transmitting terminal.

Itek Optical Systems Division of Lexington, Mass., has won a contract from the Johnson center for the camera payload system on the Space Shuttle orbiter. The cost-plus-incentive-fee contract is valued at about $4.9 million and covers the first flight system and an option for a second. Planned for space flight in orbiter's cargo bay on pallets and test racks, the orbiter camera payload system is a flexible photographic array for earth imaging surveys, remote sensing experiments and as an adjunct to non-imaging

systems. The second system option for another camera would increase the contract value by $1.5 million.

The Space Information Systems Operation of Ford Aerospace & Communications Corp., Houston, Texas, has been awarded a contract to provide three multiplexer-demultiplexer system for the NASCOM ground communications network. The amount of this firm-fixed price contract is $3.2 million. The work is to be completed within 15 months of contract award; the equipment must have a service life of 10 years. A multiplexer takes many low data rate streams and combines them into a single high data rate stream, normally for transmission to a designated point. A demultiplexer than separates these streams for routing to their respective recipients. The contract will be a responsibility of the Goddard center.

Computer Sciences Corp. of Falls Church, Va., has been chosen by NASA for negotiation of a contract for engineering support and related services to the Wallops center. The selected company's proposal for a two-year, cost-plus-award fee contract is approximately $3.8 million. The contract became effective Oct. 1, 1978 and will contain provisions for three additional one-year periods. Computer Sciences Corp. Computer Sciences Corporation will provide engineering support in the areas of instrumentation, computer operation, programming, data support aerodynamics, mechanical design and systems integration for both flight articles and ground instrumentation facilities, and for some related specializations.

The Avionics Division of Honeywell, Inc., St. Louis Park, Minn., has been selected for negotiation of a NASA contract for a demonstration advanced avionics system for general aviation. The contract calls for Honeywell to provide research and development for the design, and includes fabrication, installation and flight test of the system. Estimated cost for the cost-plus-fixed-fee- contract is 1.5 million. The Ames center is responsible for work under the contract.

General Electric Company, Space Division, Valley Forge, Pa. has been selected by the Johnson center for negotiations leading to a contract for the food system galley for the Space Shuttle orbiter. The contractor's estimated cost and fixed fee for the program is about $1.2 million. The contract will begin December 1978, and end January 1981, and work will be performed in Valley Forge. The galley contract is for a food preparation equipment (hot and cold water dispensers, oven hot water heater) and serving equipment (meal trays).

The Franklin Institute Research Laboratories and Northrop Corp. have been awarded contracts worth respectively $95,000 and $100,000 from the Aeromechanics Laboratory, Army Research and Technology Laboratories (AVRADCOM). Contract specialist is Terry Mahurin of the Ames center. The purpose of the contracts is to make a feasibility and conceptual study to determine the best method to adopt the Ames center's vertical motion simulator for research and development studies that focus on Army helicopter operations. **Paragon Pacific, Inc.,** has won a $145,733 one-year contract from the same Army laboratories to develop an advanced special purpose rotocraft simulator. Contract specialist is Ames' Dennis Padilla. AVRADCOM is located at the Ames center.

Teaching the Basics of the National Space Program

One of NASA's lesser known activities is a wide-ranging educational program in which a strong effort is made to meet the wants and needs of students and their teachers throughout the land.

NASA educators continually communicate in a variety of ways with other educators, telling them in general about the space program, sharing information about specific projects, and supplying details concerning special ventures of particular interest to students.

A great many academic institutions and individual students, for instance, have expressed keen interest in the progress of the Space Shuttle. They want to know literally everything about the matter and especially they want to know how they can become personally involved in the exciting program. They see Shuttle as perhaps an opportunity to actually travel into and work in another dimension. And it is not merely a staged drama or a work of fiction—the real thing is at hand at long last, as they see it, and they want to join in.

One tangible result of the interchange between the educational community and NASA has been the arranging of future participation by students in the Shuttle "Getaway Special" program. To date, teams and individuals from some 48 educational organizations, these ranging from high schools to postgraduate institutions, have signed up for payloads to be produced by them and put aboard the Shuttle orbiter.

Under NASA contract terms, people or organizations may rent five cubic feet of space in the orbiter cargo bay for legitimate scientific, engineering or manufacturing experiments of a self-contained nature for $10,000 a shot, with a down payment of $500.00. For that sum, NASA at some future date will transport the package to weightless orbit, expose it in the open cargo bay to the profound vacuum of space for a week to a month, and return it intact to Earth for post-flight evaluation and potential re-use. Many more reservations for student-developed space experiments are expected as the launch date for the Shuttle draws near.

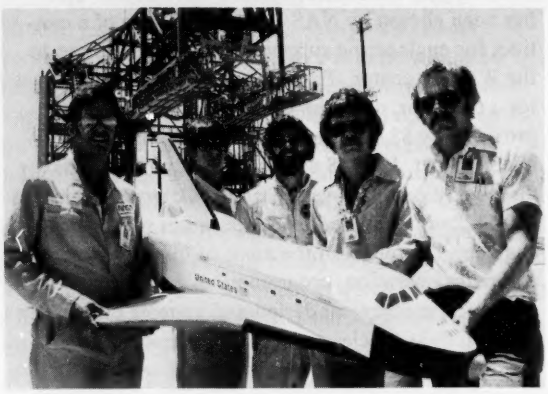
Another facet of NASA's education effort is a launch-participation program that has been in existence since 1967, particularly among universities and educators in the Pacific and Mountain States. Hundreds of people regularly enroll in and pay their way to NASA-sponsored seminars which generally last for several days. These are held at the site of a major spacecraft launch on the east or west coast, where participants can see at close range how a launch is accomplished, listen to NASA lecturers with expert knowledge of NASA systems and techniques, and attend information sessions. Such meetings have been held at the launches of Apollo 14, 15, 16 and 17, Skylab, the Apollo Soyuz Test Project and others.

The latest, a three-day International Educators' Conference, co-sponsored by the American Inst. of Aeronautics and Astronautics, was held in mid-September at Santa Maria near Lompoc, Calif., where NASA had scheduled the launch of Nimbus–G for Sept. 18. The Nimbus mission is to test sensors and technology related to pollution monitoring, oceanography and meteorology. The theme of the meeting was "A Meteorological Satellite Looks at Our Weather."

The seminar was well attended by hundreds of enthusiasts, but the guest of honor, so to speak, was missing. The launch was "slipped" to late October. Even so, few cancelled their reservations. Attendees who came from 100 or more professional organizations, universities and commercial companies paid rapt attention as they listened to a list of speakers who discussed weather, remote sensing, meteorology, satellites and deep space. Astronaut Rusty Schweickart told the audience all about NASA's applications program and defined the many benefits that have accrued to people on Earth as a result of space investigation.

Even though the Nimbus launch was postponed, the Nimbus–G (as well as another, Tiros–N, also on a slipped schedule) was on the pad at NASA's KSC Western Operations site at Vandenberg Air Force Base. The conference ended on a high note as some 200 attendees toured the launch site where NASA personnel explained the systems and problems involved in a launch and demonstrated the operation of equipment designed for the study of Earth's atmosphere from space.

Educational programs are under the administration of the Educational Services Branch in Washington, D.C. Education officers in field centers are in charge of related events in regions throughout the United States. Bernard (Mike) Donahoe is the education specialist at the Ames Research Center for western states events.



"Shuttle" Crew—Several enterprising "co-ops" at Dryden last year constructed a scale model of the orbiter and flew it. (A co-op is a college student who goes to school and also works at NASA.) The flights, which have gone as high as five feet, are made from the top of a "Shuttle carrier" (a car). Rick Wray, an engineering student at Purdue, says work began in early 1977, was picked up when ALT flights began, and the model completed just before the *Enterprise's* first flight. The model, made of cardboard, weighs 12 pounds, has 404 separate parts. The three "pilots" get radio directions from chief Wray, who rides atop a chase vehicle. The crew members, posed here against the Shuttle mate-demate device, are (l. to r.): Bob David (U. of Mich.), Jeff Tremback and Art Sheridan (U. of Ill.), Rick Wray, and Harv Janssen (U. of Ill.).

Launches for 1978—Completed and Projected

Name	Launch Date	Vehicle	Range	Mission Remarks
Intelsat IVA-(F)	Jan. 7	Atlas-Centaur	ETR	Improved communications satellite for Comsat. Reimbursable.
IUE-A	Jan. 26	Delta	ETR	International Ultraviolet Explorer—cooperative with ESA. Designed to obtain high resolution data on stars and planets in the ultraviolet region of the spectrum.
FLTSATCOM-A	Feb. 9	Atlas-Centaur	ETR	Navy fleet satellite communications. Reimbursable.
Landsat-C	March 5	Delta	WTR	Third Earth resources technology satellite.
Intelsat IVA-F6	March 31	Atlas-Centaur	ETR	Improved communications satellite for Comsat. Reimbursable.
Japan/BSE-A	April 7	Delta	ETR	Broadcasting satellite experimental. Japanese communications satellite for conducting TV broadcast experiments, Reimbursable.
AEM-1 (HCMM)	April 26	Scout	WTR	Heat capacity mapping mission to produce thermal maps for thermal intertial measurements, investigate feasibility of geothermal source location by remote sensing, and provide coverage of snow field for water runoff prediction.
OTS-B	May 11	Delta	ETR	ESA orbital test satellite.
Pioneer Venus-A	May 20	Atlas-Centaur	ETR	Planetary mission to Venus. Orbiter will measure upper atmosphere and ionosphere, study interaction between solar wind and ionosphere and magnetic field, study atmospheric and surface characteristics, determine gravitational field harmonics.
NOAA/GOES	June 16	Delta	ETR	Part of global network of geostationary environmental satellites to provide Earth imaging, monitor the space environment, and relay meterological data to users. Remibursable.
Seasat-A	June 26	Atlas-F	WTR	Sea satellite for global monitoring of ocean geoid, wave topography, surface wind speed and direction, ocean surface temperature, and ice field extent and dynamics.
Comstar-C	June 29	Atlas-Centaur	ETR	Third in a series of domestic communications satellites for Comsat. Reimbursable.
ESA/GEOS-B	July 14	Delta	ETR	ESA spacecraft to conduct scientific, investigation of waves and particles in magnetosphere. Reimbursable.
Pioneer Venus-B	Aug. 7	Atlas-Centaur	ETR	Multiprobe—will determine nature and composition of clouds, composition structure and general circulation pattern of the atmosphere of Venus from the surface to high altitudes, study interaction between planetary environment and interplanetary medium.
ISEE-C	Aug. 12	Delta	ETR	International Sun Earth Explorer. An extension of interplanetary studies with the spacecraft toward the Sun sufficiently outside the Earth's influence for comparison with results of ISEE-A and B missions and of space probes to outer planets.

Tiros–N	Oct. 12	Atlas-Centaur	WTR	Polar orbiting operational spacecraft to provide and improve meteorological data.
Nimbus–G	Oct. 23	Delta	WTR	Develop and flight test advanced sensor and technology basic to conducting experiments in the pollution monitoring, oceanographic and meteorological disciplines.
NATO III-C	Nov. 15	Delta	ETR	Communications satellite, second in series.
HEAO-B	Nov. 17	Atlas-Centaur	ETR	Second high energy astronomical observatory to study highly energetic radiation from space.
Telesat-D	Dec.	Delta	ETR	Canadian domestic communications satellite. Reimbursable.

Two Shuttle Crews Honored by Air Force—The Space Shuttle ALT crews, (l. to r.) Gordon Fullerton, Fred Haise, Jr., Joe H. Engle and Richard H. Truly, were named 1978 recipients of one of the highest awards of the Air Force Association, the David C. Schilling Award for Flight. (Schilling was a World War II ace who set many air records.) The award was presented in recognition of the successful completion of the three free flights in the approach and landing test phases of the Space Shuttle program successfully completed last year at the Dryden center. The men were cited for "contributing their skills as engineer-test pilots to the development of this spacecraft and to the advancement of aerospace technology." Past recipients include NASA astronauts, and pilots of the X–15. The award was made at a luncheon in Washington, D.C. honoring the U.S. Air Force Chief of Staff in conjunction with the 32nd annual national convention of the Air Force Association.

Patents for Inventions from NASA Research

The Office of General Counsel, NASA Headquarters, announces that the following U.S. patents have been issued by the U.S. Patent Office to NASA for inventions resulting from NASA research. Inquiries concerning them should be directed to the attention of the NASA Patent Counsel of the indicated installation.

Inventor(s) and Employer	Title	Patent No.	Installation
Ben R. Hollis, Jr.; William R. Feltner; Donald E. Routh — MSFC	Multilevel method for fabricating a metal oxide semiconductor device	4,111,775	MSFC
Melvin Lerned; Richard Erikson — U.S. Cust. Service, Washington, D.C.	Apparatus for securing vapor samples	4,111,049	HQN
Stephen F. Livermore, KSC	Lightning current detector	4,112,357	KSC
Wallace W. Thompson, NAPO	Inhibited solid propellant composition	4,111,729	NAPO
James F. Morris, LeRC	Thermocouples of molybdenum and iriduim alloys for more stable vacuum-high temperature performance	4,111,718	LeRC
Michael Charles Shai, GSFC	Electrically conductive thermal control coatings	4,111,851	GSFC
William J. Rice, LeRC	Indicated mean-effective pressure instrument	4,111,041	LeRC
James W. Wayland; Arthur I. Zygielbaum; Warren Martin; Richard M. Goldstein; William P. Hubbard — NASA Caltech, JPL.	Digital demodulator-correlator	4,112,497	NPO
Chris Gross, LeRC	Electrically scanned pressure sensor module with in situ calibration capability	4,111,058	LaRC
Frank H. Bonisch, United Tech Corp. Sikorsky Aircraft, Stratford Conn.	Locking redundant link	4,111,068	LaRC
Gerald S. Perkins, NASA Caltech, JPL	Sun tracking solar energy collector	4,111,184	NRLO
Eugene A. Laumann; Rollin K. Reynolds — NASA Caltech, JPL..	Hydrogen-fueled engine	4,112,875	NRLO
John I. Shafer; Harold E. Marsh, Jr. — NASA Caltech, JPL..	Solid propellant motor	4,116,131	NRLO

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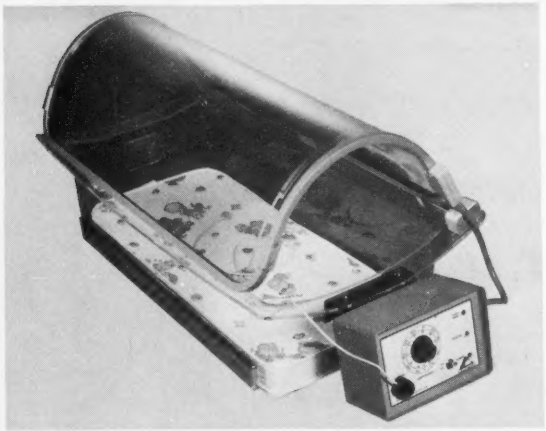
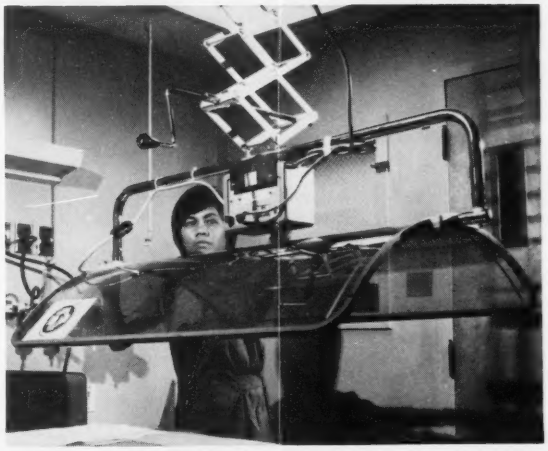


The Infant Radiant Warmer—The canopy, which has a film of electricity conducting gold, emits uniform, controlled heat to warm a cradled infant.



The Apollo Radiant Warmer—Burn patients receive essential warmth for more effective treatment.

Another Dividend from Air and Space

Research and development in aeronautics and space have provided numerous benefits for all Americans—and at a tiny percentage of the tax dollar. Here is an example:

An Assist for the Helpless

An infant radiant warmer has helped scores of newborn and premature babies to survive their most dangerous hours—the "period of apprehension," the first six to 12 hours after birth—when they must struggle to survive in the hostile environment outside their mother's body.

To lessen the danger to the life of these tiny beings, many hospitals have installed "golden canopies" in nurseries and in post-operative recovery rooms. The device is an offshoot of the heated faceplates first built into pressure suit helmets worn by pilots flying Air Force/NASA reconnaissance and weather research aircraft, and later used in the helmet faceplates worn by Apollo astronauts.

The canopy atop an infant's bassinet provides the warmth vital to newborn and especially to premature babies. They lose heat much more rapidly than adults because their body surface is greater compared to body mass. The warmer is composed of laminated layers of transparent plastic which encase a thin film of gold. Coating is electrically conductive; when energized by electricity, the canopy emits low energy radiant heat over the entire body. A specially designed skin sensor allows for temperature control adjusted precisely to each baby's individual needs. The cradle warmer has no noise-producing element for heat generation and there is no burn hazard to either infant or nurse. It also offers the advantage of total visibility since no blankets are necessary and the naked baby can be constantly observed for changes of color or other bodily indications of distress.

The same principles were embodied in a later invention, a transport incubator system which is used to transport seriously ill infants by airplane or ambulance. The incubator is an intensive care system consisting of a transparent radiant warming hood enclosing the cradle; a monitor that displays readings of heart rate, respiration, blood pressure and other bodily functions; and a therapy module that provides capabilities for ventilation, air/oxygen blending, fluid removal or infusion of fluids.

A third application is called the Apollo radiant warmer, a system designed specifically for burn patients, which counters hypothermia (low body temperature, characteristic of serious burns). The system works like a cradle warmer and eliminates the need for hoops and blankets around the patient. It provides a controlled thermal environment that significantly reduces shivering and the resultant overuse of the energy so badly needed to fight infection and renew damaged cells.

The basic technology for all three products was developed by the Sierracin Corp.; the manufacturer is the Cavitron Corp., Anaheim, Calif.*

*NASA does not endorse commercial products developed as a result of its Technology Utilization or Patent Licensing Programs, but it does encourage the widest possible use of its technology.

(See illustrations on page 31.)

For the benefit of all . . .

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